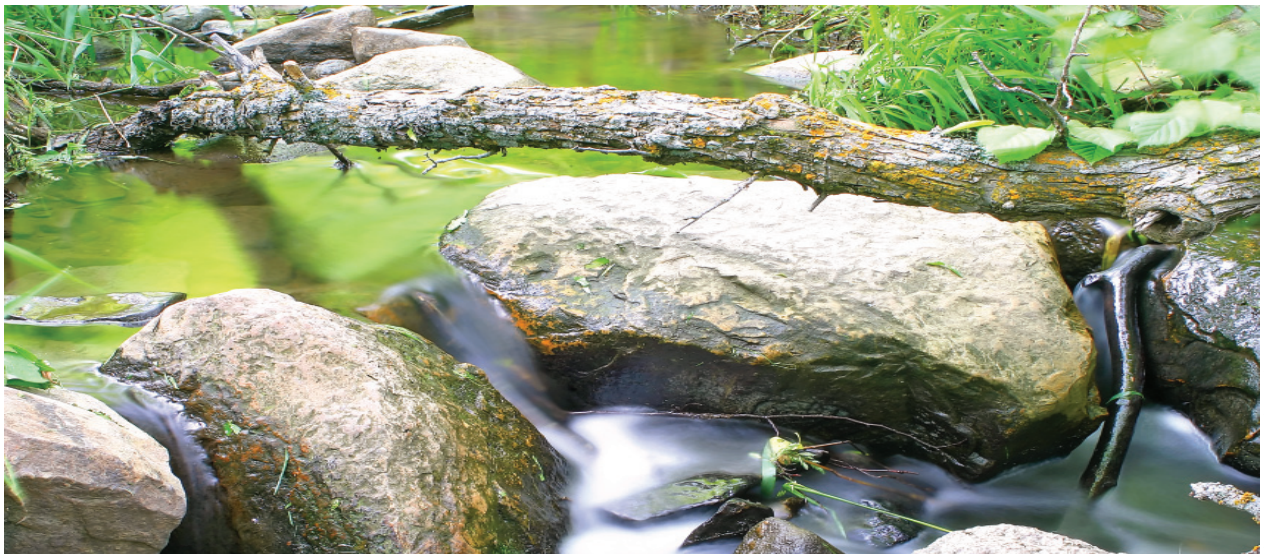
4 Affected Environment



Scott Ralston/USFWS

Flowing stream.

This chapter describes the current characteristics and resources of Sullys Hill National Game Preserve. It specifically addresses physical, biological, cultural, and socioeconomic resources, as well as recreational opportunities.

4.1 GENERAL OVERVIEW

Sullys Hill National Game Preserve is a 1,675-acre national wildlife refuge sitting on the south shores of Devils Lake, about 10 miles south of the city of Devils Lake, North Dakota. The refuge supports a unique community of habitats such as an oak, ash, basswood and aspen woodland, mixed-grass prairie, and natural wetlands along with beaver ponds and created wetlands (see figure 5, boundary map). It is also one of only 19 identified sites to be listed in North Dakota's list of natural areas, of which only 4 are national wildlife refuges. In addition, the refuge is one of 4 refuges nationally established for the purpose of bison conservation.

Administratively, the refuge consists of two non-contiguous blocks of land (see figure 5, boundary map). The main unit of the refuge supports the big game forest, lower forest, big game prairie, several wetlands, and the public use and education infrastructure. The second block of land is comprised of windbreaks, south forest, south prairie, haylands and wetlands (see figure 6, management units map).

The refuge blends a unique plant community with a diverse mixture of wildlife in an area of historical, geological, and archaeological significance. The woods and prairies of the refuge sit atop the glacial moraine hills and rise to an elevation well above the level of Devils Lake. The area is a thrust block formation resulting from glaciers mining a large area, now called Devils Lake, and depositing all this material in the range of hills which includes the refuge. Thus, the refuge is a unique landform or anomaly within this flat prairie region. As such, this area is a large ecotone that provides "edge" habitat for many species of birds as well as plains bison, elk, white-tailed deer, turkeys, and prairie dogs. More specifically, this edge is the joining of palustrine (vegetated wetlands) and lacustrine (lake) wetlands with woodlands and grasslands. This ecotone is very attractive to many forms of wildlife, including over 250 species of migratory birds; unique small mammals, such as woodchucks and fishers and the large ungulates that have made the refuge a destination for many visitors. A primary purpose of the refuge is to provide habitat and breeding grounds for birds.

The unique topography of the refuge also provides for some unique plant species that are

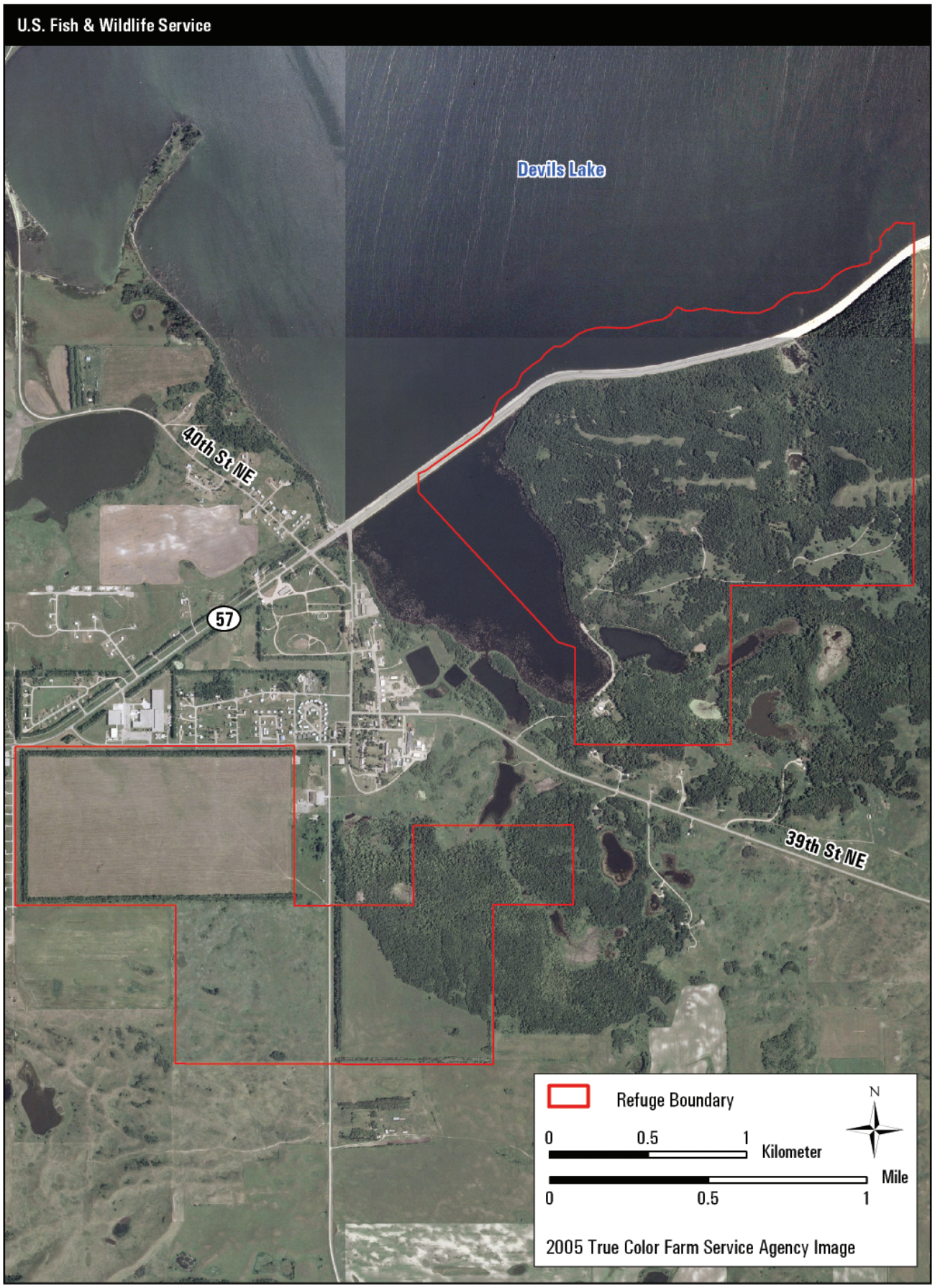


Figure 5. Sullys Hill National Game Preserve boundary map.

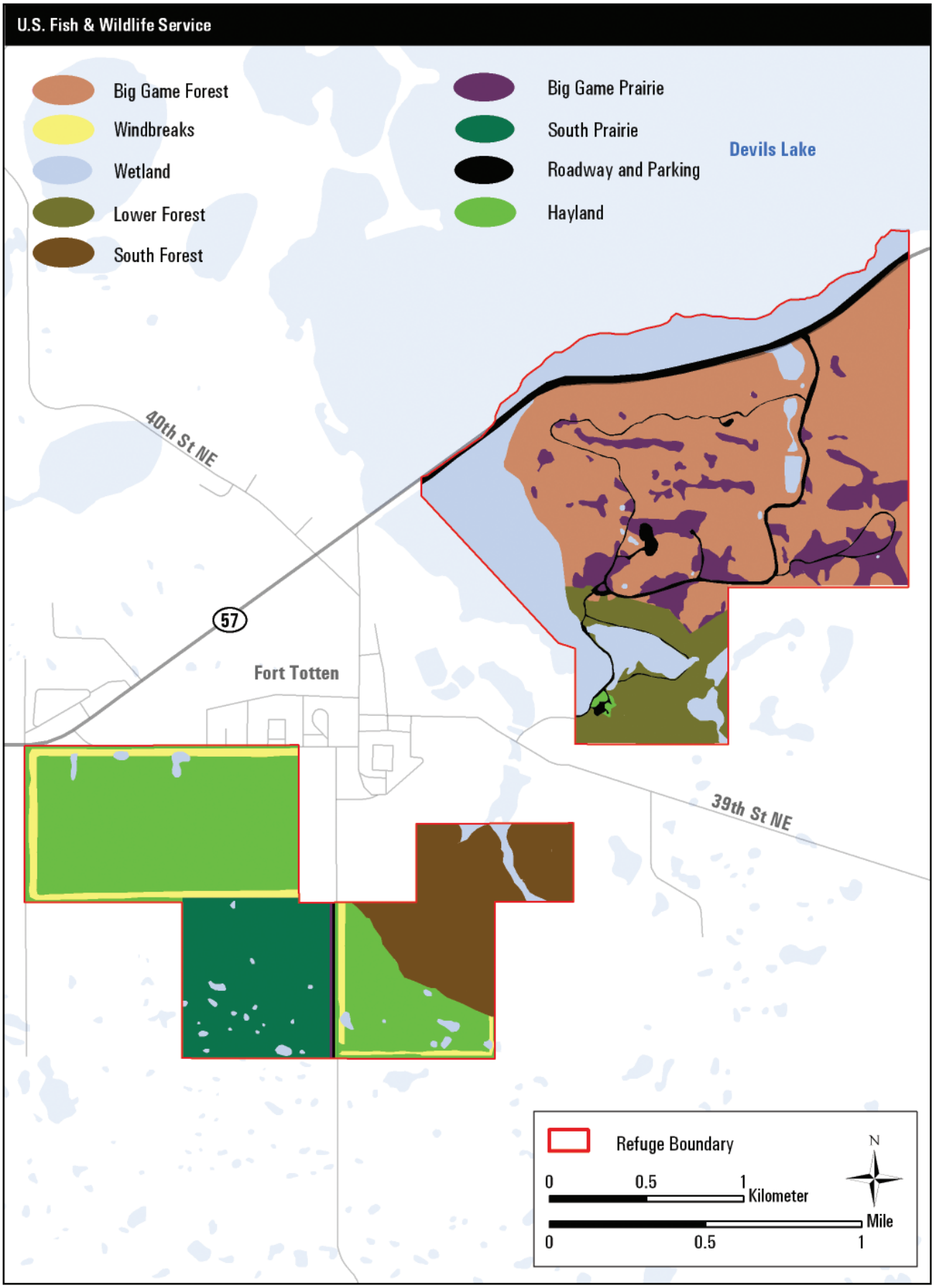


Figure 6. Sullys Hill National Game Preserve management units.

not common to the area. These plants include ferns, ball cactus, sarsaparilla, downy paintbrush, Indian pipe, showy lady's slipper, and marsh marigolds.

This exceptional mix of topography, vegetation, and wildlife attracts many visitors to the area because of the variety of interaction with easily-accessible flora and fauna (plants and animals). Visitation has long been a tradition at the refuge. In the early years, the area was frequented by visitors for picnics, enjoying the playgrounds, reunions, and other "park-type" activities. As the area transformed from a park into a game preserve and refuge, so did visitor activities. Gradually, the refuge is becoming a progressive regional conservation learning center, promoting the conservation role of the Refuge System, as well as educating the public about the functions and benefits of prairie wetlands and grasslands. Additional learning opportunities are available through hiking trails, scenic wildlife overlooks, a self-guided auto route, and the refuge education and visitor center. All activities support efforts to educate and provide interpretation to visitors through premier education facilities. Ultimately, the refuge uses the dual concept of indoor and outdoor environmental education with a focus on the sciences, biodiversity, and human dimensions in the environment and provides area educators an environment that makes learning more exciting and interesting.

Sullys Hill National Game Preserve has gained much community support and boasts North Dakota's first refuge "friends group." This group has supported special events such as the "Birding and Nature Festival" and "Sullys Hill Winterfest." The refuge has become the Service's link to the community and the traveling visitor. While visiting, they receive information on the values of wetland and grassland conservation and the roles of the Refuge System.

4.2 PHYSICAL ENVIRONMENT

The following sections describe physical environmental resources that may be impacted by the implementation of the CCP. Physical characteristics include physiography, geography, soils, water resources, climate, and the effects of global warming.

Introduction

Sullys Hill National Game Preserve's hilly terrain is a prominent fixture on the south shore of Devils Lake. Bluemle (1991) indicates that Devils Lake occupies the former valley of the ancestral Cannonball River, and that the large-scale glacial activity that occurred in North Dakota formed the lake and adjacent hills, including Sullys Hill. This part of North Dakota is situated in the drift prairie physiographic region, and Sullys Hill National Game Preserve is specifically included in the end-moraine complex ecoregion. The refuge is considered part of the Devils Lake Wetland Management District Complex, headquartered at Devils Lake, where greater than 250,000 acres of Refuge System lands in northeastern North Dakota are protected and managed.

Physiography, Geography, And Soils

The Devils Lake basin is a distinguishing feature of the drift prairie physiographic region, and according to Bluemle (1991) is one of the largest and best-defined glacially excavated depressions in central North America. By most accounts, it is considered an internally-drained basin that spans an area of around 3,810 square miles. When water levels rise to 1,446.5 feet above mean sea level (amsl), they overflow southeastward into the Stump Lake system. In the event that the combined waters of Devils Lake and Stump Lake rise to approximately 1,459 feet amsl, the southern moraines are breached and waters overflow into the Sheyenne River . Since 1993, Devils Lake has risen 25.5 feet in elevation, and the volume of water has quadrupled to a current acreage of 134,000 acres (U.S. Geological Service 2007).

In geological terms, Sullys Hill is considered an ice-thrust landform, consisting of a discrete hill of glacial deposits and Cretaceous shale down glacier from the Devils Lake basin. This landform was likely created as a result of the last known glacier, which occurred 12,000 years ago, and is known as the Late Wisconsinan Glacier. This moved over the Spiritwood aquifer, underlying the current day Sullys Hill/Devils Lake thrust complex, and pressurized the water with its tremendous weight. As a result, a large block containing brecciated shale and deformed glacial sediment was shoved up (creating Sullys Hill), and a lake-filled depression (now Devils Lake basin) formed in the area where the block was removed (Bluemle 1991). Bluemle (1991) indicates that the total relief between the bottom of Devils Lake to the adjacent ice-thrust Cretaceous blocks exceeds 650 feet.

The soils identified in Benson County are believed to be formed from glacial material derived from pre-glacial granite, gneiss, sandstone, shale, limestone, and basalt (Strum et al. 1977). Soils that underlie the refuge are those typical of deep, rolling, well-drained soils on glacial till plains

and moraines. The ridge tops and surrounding slopes of the refuge support hardwood trees and typically have a thin topsoil layer. Available water capacity in these areas may be high, and rapid runoff and water erosion regularly occurs. Other hardwood vegetated areas of the refuge are associated with alluvial soils present at the base of slopes and are often present in coulees that were formed by glaciation and erosion. Also prominent across these soils are thick layers of organic material. The latter is a direct result of plant material breakdown that occurs with high soil moisture content and humidity. This decomposition is supplemented by the continual erosion of uphill slopes which produces a layering affect of soil and organic matter.

The prairie areas of the refuge typically contain deep undulating to hilly, well-drained, medium-textured soils formed in loam glacial till. Map units included for these soils possess slow permeability, with high available water capacity and rapid runoff potential (Strum et al. 1977). These prairie areas are located in the noncontiguous portions of the refuge and in scattered areas throughout the woodland portions of the refuge.

Water Resources

Portions of the Devils Lake basin also are included within the boundary of the Sullys Hill National Game Preserve. Devils Lake is primarily an internally-drained basin that has been rising rapidly since a historical low around 1940. Lake levels in 1992 were approximately 1,423 feet, while current levels hover around 1,446 feet, and even reached 1,449 in 2006. Recent records and even prehistoric estimations indicate that the water levels in Devils Lake have fluctuated significantly, usually owing to the dynamic climate of the region. A primary factor in the most recent rise that started in 1993 was the above-normal precipitation that has continued for more than a decade. Unfortunately, because of the significant loss of wetlands in the upper basin, the capacity to store water has been reduced. This flooding has impacted tens of thousands of acres of the Devils Lake Basin, including towns, communities, roads, and agricultural land. The high water levels in recent years preempted the relocation of multiple refuge buildings.

In addition, the refuge is located within the Prairie Pothole Region of the United States. The scouring and shearing action of glaciers or the collapse of ice blocks left to melt after the glaciers retreated, formed shallow basins across the landscape, known today as prairie potholes (Kantrud et al. 1989). These potholes encompass myriad small wetlands ranging from wet meadows and shallow ponds to saline lakes, marshes, and fens. It is estimated that, in the late 1700s, between 7 and 8 million acres of wetlands existed in North and South Dakota combined (Dahl 1990). There are approximately 30 prairie pothole wetlands across Sullys Hill National Game Preserve.Water quality and water rights are not major issues at the refuge.

Climate

Sullys Hill National Game Preserve has a continental climate characterized by relatively warm short summers, long cold winters, and rapidly changing weather patterns. January is the coldest month, with an average mean temperature of -6°Fahrenheit (F), while July is the warmest, averaging 81°F. The average growing season varies from 98 to 106 days.

The average high temperature for the year is 49°F with the average low being 28°F. The average daily summer temperature ranges from 5°F to a high of 81°F with 10.8 days above 90°F. The average winter temperatures range from -6°F to a high of 34°F, with 189 days below freezing (32°F or below). High winds are prevalent all year and can create extreme wind chills.

Average annual precipitation is 17.5 inches. Average snowfall is 35.7 inches per year, with the greatest amount normally received during December. In the winter, snow and high winds can bring frequent blizzard conditions to the area. The frost-free season generally runs from May 20 to September 15.

Global Warming

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change effects as part of long-range planning endeavors. The Department of Energy's report, "Carbon Sequestration Research and Development," concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. The report defines carbon sequestration as "the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

The increase of carbon dioxide (CO_2) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as "global warming." In relation to comprehensive conservation planning for

Refuge System units, carbon sequestration constitutes the primary climate-related effect to be considered in planning.

Vegetated land is a tremendous factor in carbon sequestration. Large, naturally-occurring communities of plants and animals that occupy major habitats—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as biological "scrubbers" of atmospheric CO_2.

One Service activity in particular—prescribed burning—releases CO_2, directly to the atmosphere from the biomass consumed during combustion. However, there is no net loss of carbon because new vegetation quickly germinates and sprouts to replace the burned-up biomass. This vegetation sequesters approximately an equal amount of carbon as is lost to the air (Dai et al. 2006).

Several other effects of climate change may need to be considered in the future:

- Habitat available in lakes and streams for cold-water fish such as trout and salmon could be reduced.
- Forests may change, with some plant species shifting their range northward or dying out and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat because of stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of synchronization with the life cycles of their prey.

4.3 BIOLOGICAL RESOURCES

The following sections describe the biological resources that may be impacted by the implementation of the CCP. Biological characteristics include vegetation communities, birds, mammals, insects, reptiles, and amphibians.

Introduction

The Sullys Hill National Game Preserve landscape is distinguished by the prominence of native hardwood forest habitat, interspersed with pockets of mixed-grass prairie and associated wetlands (see figure 6, management units map). The refuge supports a diversity of wildlife, including naturally-occurring species such as migratory birds, as well as reintroduced species including bison, Rocky Mountain elk, and white-tailed deer. The climax forest on Sullys Hill National Game Preserve is dominated by American elm and basswood, while cooler, dry areas and north-facing slopes are covered with bur oak and green ash. The mixed-grass prairie areas support species typical of this prairie type, including porcupine grass species and even big bluestem species.

Vegetation Communities

This section describes the three vegetation communities present at Sullys Hill National Game Preserve, namely woodlands, grasslands, and wetlands. Spatial distributions of these habitats are shown on a map (see figure 7, vegetative communities map).

Woodlands

Although the mixed-grass prairie is typically considered the climax vegetation of the northern Great Plains (Clements and Shelford 1939), native woodlands occur where moisture and soil regimes provide necessary support (Hopkins 1984), and where protection (such as lakes and rivers) from fires would have existed. Stewart (1975) indicated that only about 2% of North Dakota is forest habitat. The majority of this was in the Turtle Mountains, Killdeer Mountains, Pembina Hills, and the Devils Lake area, as well as along major rivers and associated tributaries (Haugen et al. 2004). The Pembina Hills in northeastern North Dakota and the Turtle Mountains in northcentral North Dakota are considered the two major deciduous forest ecosystems in the state (Faanes and Andrew 1983). Sullys Hill National Game Preserve is also part of this unique habitat across the state with its nearly 700 acres of native deciduous forest. The refuge was likely protected by the nearby river valleys and Devils Lake basin and therefore did not endure frequent fires as did the surrounding grasslands. In addition, Heidt (1977) indicates that differences in soil parent material at the refuge also played a role in supporting the occurrence of woody vegetation. Severson and Sieg (2006) indicate that possible tree species in the Devils Lake area from 1797–1871 were quaking aspen, white oak, black oak, bur oak, ash, elm, linden, and box elder. The big game forest, lower forest, and south forest are native woodlands with mixed deciduous hardwood trees. Predominant woodland species across the refuge include:

- bur oak
- American elm
- box elder
- American basswood
- green ash

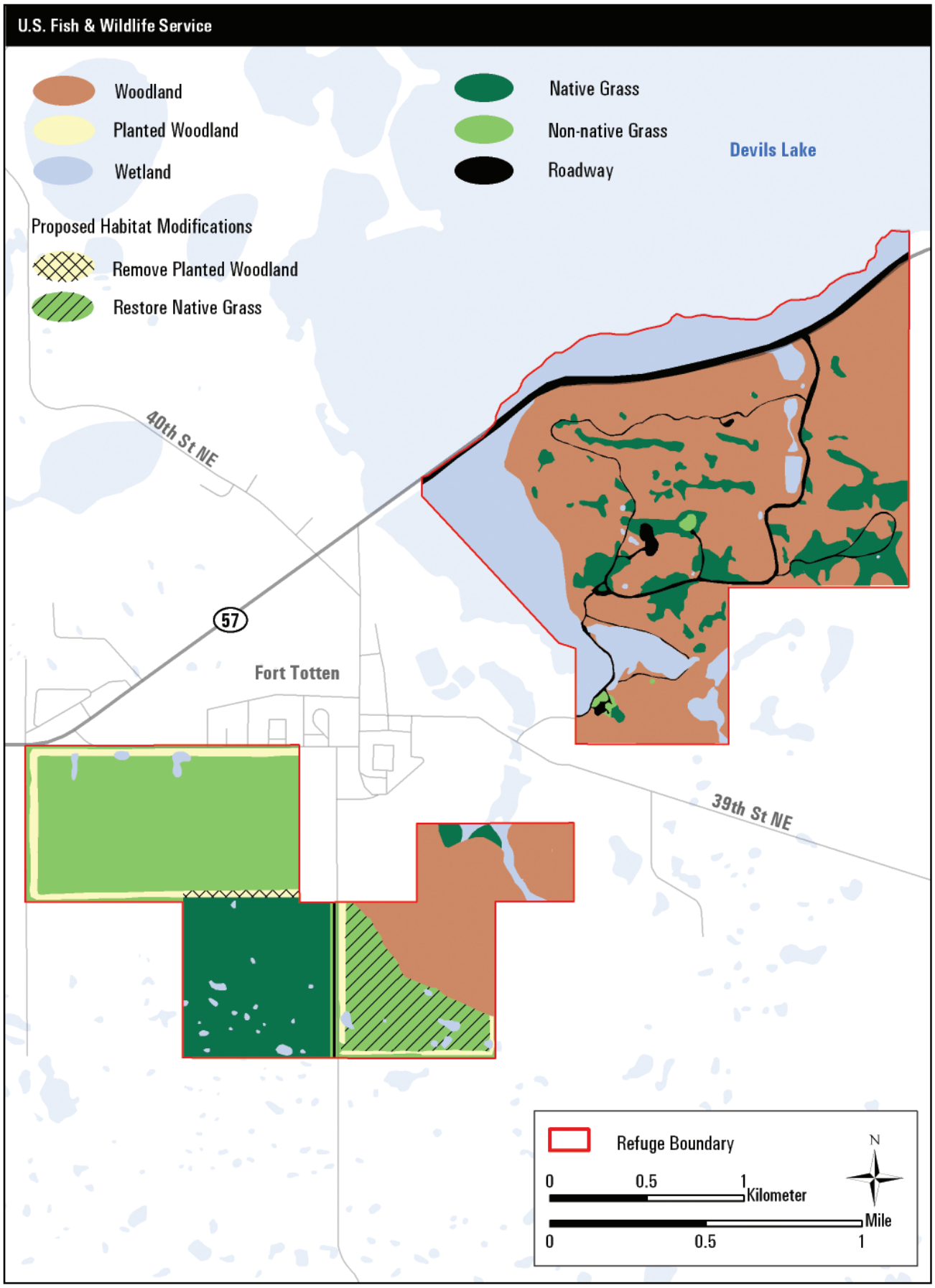


Figure 7. Vegetative communities within the Sullys Hill National Game Preserve.

- cottonwood aspen
- chokecherry
- paper birch
- hawthorn
- wild plum
- western snowberry

There are stands of hardwood trees within the big game forest that are located on the ridge tops and surrounding slopes. Throughout this CCP, these areas are referred to as oak-dominated areas. Overstory species in these areas are bur oak and green ash, and possibly an occasional American elm or American basswood. The predominant understory species is chokecherry, while western snowberry is the primary shrub species. The predominant herbaceous species covering the forest floor are sedge species, Virginia wildrye, and smooth brome. Throughout the big game forest are hardwood trees found on the bottom and side slopes of ravines and adjacent overflow sites. Throughout this CCP, these areas are referred to as basswood-dominated areas. Overstory species in these areas are American basswood, bur oak, green ash, box elder, and an occasional American elm. The most prevalent understory species are overwhelmingly chokecherry, intermixed with American basswood, American elm, and box elder. Western snowberry is the major shrub species, and forest floor cover mainly consists of sedge species. The primary management activity implemented throughout this forest is ungulate grazing, with infrequent fire and occasional selective harvesting activities.

Similar species exist in the lower and south forests, which are not accessible to the ungulates in the big game forest. For oak-dominated areas, the bur oak and green ash are the most prevalent overstory species, mixed with a few American basswood and box elder trees. Dominant understory species are bur oak, green ash, basswood, and chokecherry. Shrub species also occur in these areas, including western snowberry and Juneberry. In the basswood-dominated hardwood forest areas, the dominant overstory species are green ash, American elm, and basswood, intermixed with other species such as white birch, bur oak, and aspen. The two dominant species in the understory are green ash and chokecherry. Other species that occur in the understory are bur oak, American elm, and aspen. Western snowberry is the primary shrub species, however, a few Juneberry shrubs also occur. Forbs also flourish in the understory, including species such as wild sarsaparilla, poison ivy, meadow rue, cow parsnip, golden alexander, and even a few unique orchids. Past management in these forests was primarily idleness, with an occasional fire and minor selective harvesting activities.

Grasslands

Grassland acreage lost in North Dakota since settlement is estimated at upwards of 70% (Conner et al. 2001). More vividly stated, <1% of the original eastern tall-grass prairie and about 32% of the mixed-grass prairie remain in North Dakota (Samson and Knopf 1994, Samson et al. 1998). Grasslands throughout Sullys Hill National Game Preserve are situated in the mixed-grass prairie of the drift prairie physiographic region; however, the tall-grass prairie can be found just east of the refuge boundary. Plants of the refuge's prairie are characterized by the warm-season grasses of the short-grass prairie to the west and the tall-, cool- and warm-season grasses to the east. This ecotonal mixing from the west and east causes the mixed-grass prairie to possess more plant species than other types of prairies, including short-, intermediate-, and tall-grass species (Samson et al. 1998).

Vegetation composition at the regional and local levels was determined by several interrelated factors, including elevation, topography, climate, soil characteristics, herbivory, and fire (Coupland 1950, Hanson and Whitman 1938). Based on the locality of the refuge, local vegetative associations would have been more mesic (adapted to an environment having a balanced supply of moisture) than areas to the west. The drift prairie physiographic region of North Dakota is classified in the wheatgrass—bluestem—needlegrass category. Species characteristic of this region include slender wheatgrass, little bluestem, fringed sage, white sage, white prairie aster, side-oat grama, blue grama, purple coneflower, prairie junegrass, blazing star species, silver-leaf scurf-pea, prairie rose, goldenrod species, needle-and-thread grass, and green needle grass (Kuchler 1964). With influence from the adjacent tall-grass prairie, many notable grasses from this grassland type are present, including big bluestem, Indian grass, and switch grass.

Prairie grasslands function similar to a living organism by responding to activities within the ecosystem. They evolved with natural disturbances such as fire and herbivore grazing, and changes or interruptions in these processes, coupled with variations in climate, alter species composition. The prairie forbs and grasses have developed biological adaptations that enable them to thrive with herbivore grazing. Manske (2000) states that grazing pressures actually increased grassland expansion through co-evolution with mammals. The evidence of fire as a historical

natural disturbance suggests that native people used fire in hunting, and often natural fires occurred with lightning strikes. Fire continues to serve as a valuable tool to rejuvenate the growth of native plants and reduce woody and exotic plant invasion. Another significant change after burning is the increase in the number of plant species, which likely attracts several species of indigenous wildlife as vegetation structure (height, density) is diversified and the range of potential food resources is increased. Several sources indicate that native grasslands devoid of grazing and fire deteriorate quickly (Anderson et al. 1970, Kirsch and Kruse 1973, Schacht and Stubbendieck 1985).

Across North Dakota, these natural disturbance regimes are necessary to sustain ecosystems, but are mostly absent due to human interventions that modified the physical and biotic conditions of the landscape (Hobbs and Huenneke 1992). Domestic cattle replaced native grazers such as the American bison and prairie dog, which exhibit different grazing behaviors and affect vegetation differently (Schwartz and Ellis 1981). Uncontrolled fires were another natural process that maintained the biotic integrity of prairie grasslands, but are not currently a regular part of sustaining the ecosystem. Even though native remnants remain in the mixed-grass prairies, most tracks of land are extremely degraded (Johnson and Igl 2001). Rather than a diverse and varying habitat structure across the landscape, the current patches of grassland are relatively simple and uniform and not necessarily advantageous to the indigenous wildlife that evolved within this ecosystem.

Grasslands across Sullys Hill National Game Preserve cover 580 acres, including 252 acres of native sod and 328 acres of old cropland. For the purpose of this CCP, native sod is defined as grassland that has never been broken by mechanical means (that is, plowed). Conversely, old cropland areas were previously cultivated and reseeded to smooth brome and alfalfa for the purpose of ungulate forage. The distinction between grassland types is critical because the system potential (for example, what plants will be favored or discouraged under the given environmental conditions) and associated management options (the use of mechanical disturbances) differ between lands that have and have not been previously plowed. The big game prairie is native sod managed by the grazing of Rocky Mountain elk and bison since 1917 and 1918, respectively. These areas of native sod are isolated patches embedded within the big game forest of the refuge. According to the refuge's "Fenced Animal Management Plan" (Veikley 1984), the elk population ranges from 15–20 animals in the winter to 20–25 animals in the summer. Similarly, the bison population ranges from 25–30 in the winter and 30–40 in the summer. Grazing by these animals has been the primary management for these native sod areas in the big game prairie. Although invaded by smooth brome and Kentucky bluegrass, these areas support several native grasses such as western wheatgrass, bearded wheatgrass, greenneedle grass, and big bluestem, along with several native forbs including prairie smoke, goldenrod, white sage, and scarlet gaura.

Another tract of native sod associated with Sullys Hill National Game Preserve is the south prairie (see figure 6, management units map). Historically, this area was under a management regime of idleness except for sporadic wildfires, primarily caused by arson. In the past few years, prescribed fire has been consistently used in an attempt to reduce the smooth brome, Kentucky bluegrass, and woody species present. Baseline data collected in 2007 using the belt-transect method (Grant et al. 2004) indicates that current vegetative composition includes 31.4% smooth brome and Kentucky bluegrass groupings, nearly 7% silverberry and western snowberry groupings, and slightly more than 61% native grass and forb groupings. The primary native grass identified across this field is porcupine grass, as well as plains muhly, bearded wheatgrass, upland sedges, and big bluestem. Also prevalent are a diversity of forbs, notably wood lily, pasque flower, prairie smoke, blanket flower, black-eyed Susan, northern bedstraw, goldenrod, and many more. The plant association sheet utilized for the baseline data is included in appendix D. The 328 acres of old cropland that occur at the refuge have been historically hayed annually as winter forage for the ungulates in the big game forest and prairie units. Dominant plant species in these fields are smooth brome and alfalfa. These areas were last seeded to these introduced species more than 15 years ago.

Wetlands

Wetlands are areas where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin et al. 1979). Wetlands are extremely productive and important to both migratory birds and other resident wildlife. They serve as breeding and nesting habitat for migratory birds and as wintering habitat for many species of resident wildlife. Humans also benefit from wetlands because these habitats improve water quality and quantity, reduce the effects of flooding, and provide areas for recreation. Wetlands associated with the refuge

are located in the Prairie Pothole Region. They are characterized by numerous depressions that are relatively shallow and dominated by emergent plants. These are referred to as palustrine wetlands, and specifically in North Dakota, these wetlands occupied the millions of shallow basins that resulted from glacial scouring and the melting of buried blocks of glacial ice (Kantrud 1983).

The refuge is located within the Devils Lake Basin and bordered by Devils Lake, proper. Unlike the other wetlands across the refuge, Devils Lake is a lacustrine wetland, meaning it typically includes large areas of open water with active, wave-formed shorelines and no persistent emergent vegetation in the central or deepest zones (Kantrud 1983). With the current record-high water levels of Devils Lake, over 200 acres of the refuge are underwater as of the writing of this document.

Finally, several fresh water springs occur throughout the refuge with moderate out-flows. One spring was developed for use as a permanent watering site for big game in 1940, but is no longer functional for this purpose. These springs are perhaps an option for wildlife watering in the future.

Wildlife

Birds

Although prairie woodlands occupy only about 1% of the northern Great Plains (Girard et al.1989), their significance to the natural resources is disproportionate (Rumble and Gobeille 1998). These woodlands contribute to local and regional avian diversity (Knopf and Samson 1994) and serve as important breeding and migratory habitat (Moore et al. 1995, Rodenhouse et al. 1995). The forested areas of the refuge contribute to local avian diversity and likely provide habitat for forest species (such as red-eyed vireo, rose-breasted grosbeak, veery, and overnbird) that have shown regional or continental population declines. Collected baseline data identified 184 bird species across the prairie, woodland, and wetland communities of the refuge (see appendix D). However, considering these varying habitats, it is estimated that up to 270 species may use the refuge for both breeding and as a stopover site. Several of the species that use the woodlands are considered forest-interior breeding birds and require large unfragmented blocks of forested habitat, which the refuge provides. A few birds characteristic of this habitat include ovenbird, pileated woodpecker, hairy woodpecker, black and white warbler, veery, and red-eyed vireo. The red-eyed vireo, yellow warbler, common yellowthroat, eastern wood peewee, ovenbird, and least flycatcher are the most frequently detected woodland species recorded during refuge baseline data collections. In addition, bald eagles frequent the refuge as a staging area during the spring and fall migration and typically use the edge of Devils Lake that borders the east of the lower forest.

The grasslands of the refuge likely provide limited habitat for grassland-dependent birds, especially those species with high area sensitivity. The largest contiguous block of grassland habitat is currently the south prairie, at 150 acres in size, with other blocks throughout the refuge ranging from 1–15 acres. These latter areas are buffered by the woodlands that typically surround the grasslands throughout the refuge. Bird species characteristic of the contemporary mixed-grass prairie of the drift prairie region of North Dakota are the Savannah sparrow, clay-colored sparrow, and bobolink. Based on baseline data collected throughout the grasslands of the refuge, the most frequently detected grassland birds are the bobolink, grasshopper sparrow, and clay-colored sparrow.

The wetlands of the refuge support several species of waterfowl as well as other wetland-dependent birds. Canada geese, mallards, wood ducks, blue-winged teal, hooded mergansers, northern shovelers, and gadwalls are all considered abundant or common at the refuge during the breeding season (USFWS 2004). Several wading birds also use the refuge wetlands, most commonly the black-crowned night heron and less commonly the great blue heron. In addition, double-crested cormorants and American white pelicans are considered abundant, especially on the wetlands contiguous with Devils Lake.

Wild turkeys were brought to North Dakota over a half-century ago through an introduction program spearheaded by the Izaak Walton League (Wilson 2004). At Sullys Hill National Game Preserve, turkeys were first introduced in 1989 and again in 1998. In 1989, 24 Meriam's turkeys were transferred from J. Clark Salyer National Wildlife Refuge, and in 1998, 16 Eastern turkeys were transplanted from Judson, North Dakota. This species remains a prominent wildlife species in the big game forest of the refuge, with the population averaging 20–50 animals, dependent upon several variables such as climate and sex ratios.

Mammals

Sullys Hill National Game Preserve is prominently known for its resident plains bison

and Rocky Mountain elk, the preservation and protection of which is a purpose of the refuge. The following sections describe these and other mammals that use refuge resources.

Bison

In eastern North Dakota, it is hypothesized that bison existed, at one time or another, within every square mile of the eastern part of the state. The examination of journals and diaries of explorers and adventurers to the area indicate that bison, prior to 1880, were plentiful all the way up the Sheyenne River to Devils Lake. Although considered a creature of the open grasslands, there is evidence that bison used woodland and riparian areas in search of water and shelter from winter storms in the region. It is suggested that bison regularly moved between seasonal ranges, wintering in the aspen parklands or woodland areas and summering on the open prairie (Epp 1988, Moodie and Ray 1976; Morgan 1980). Some theories disagree with the concept that all bison were this migratory, while other sources indicate that some herds migrated and some did not. A synthesis of historical records conclude that bison moved in response to local conditions of forage availability, influenced by weather, fire, and previous grazing. For example, Epp (1988) states that bison would remain in wooded areas for the duration of the year if their needs for forage, water, and shelter were met. Year-to-year variations in environmental conditions, including weather, fires, and human interference, would have driven the migratory behaviors of bison (Severson and Sieg 2006). Considering this information, it is evident that bison were present in the region of Devils Lake and likely would have used woodland habitats at least for protection during winter months, and possibly more frequently on a variable and sporadic basis.

Estimates of the number of North American bison, pre-European settlement, vary significantly, but bison likely occurred in the tens of millions (Shaw 1995). A variety of theories exist as to the reasons for the rapid decline of bison, including the following: the mid-1800s commercial slaughter, American Indian hunting, trade pressures, the introduction of horses to native cultures, the division of the plains by railroads, and finally, newly introduced bovine diseases. Commercial slaughter of bison in the mid-1800s likely played the most significant role in the bison population reduction of the 1800s. Estimates of remaining bison in the late 1800s vary between approximately 600 and 1300. Formation of the American Bison Society in 1905 resulted in Congressional establishment of six federally managed public bison conservation herds between 1907 and 1919. Four of these herds are currently managed by the U.S. Fish and Wildlife Service, while both the Yellowstone and Wind Cave National Park herds, established in 1902 and 1913, are managed by the National Park Service (Boyd 2003, Halbert 2003).

Six bison were introduced into the refuge in October 1918 from the Portland City Park, Portland, Oregon. Herd structure included the herd matriarch and her offspring (2 bulls and 3 cows). Based on historical documentation, it is believed that the herd matriarch was obtained by the Portland City Park from the Conrad herd around 1906 through a trader named B.H. Denison in Ravilli, Montana. In 1932, the first introduction since the establishment of these 6 occurred with a bull from Wind Cave National Park. Nine other introductions are recorded between 1941 and 1997, including bison from the National Bison Range, Fort Niobrara National Wildlife Refuge, and Theodore Roosevelt National Park. Since 1980, herd numbers averaged 30 animals at the refuge, with the highest population of 40 occurring in 2006. Recent genetic testing on the herd indicates that there is possibly no hybridization with domestic cattle, making this the only Service herd with such potential based on current methods of testing. In 2006, this herd was transported to Fort Niobrara National Wildlife Refuge in Valentine, Nebraska, for propagation into a "minimum viable population" which would include several hundred to a couple thousand animals. Subsequently, 7 bison from the National Bison Range in Moise, Montana were transferred to the refuge to start a new herd. Based on current methods of genetic testing and analysis, these new animals do not possess cattle hybridization and come from a herd that holds more unique alleles than any other herd across the U.S. Fish and Wildlife Service.

Rocky Mountain Elk

Records indicate that elk were also plentiful throughout the region prior to European settlement. According to Severson and Sieg (2006), they appeared nearly everywhere, specifically in habitats close to woodland cover, including the Red River Valley and its tributaries, such as the James River and Devils Lake. During the 1860s, it is recorded that elk were especially common along the wooded areas of the Sheyenne River and Devils Lake. Based on a review of early documentation of the region, elk were mentioned more frequently than any other animal except bison. Most sources agree that elk did not migrate and likely spent significant amounts of time in the wooded areas rather than in the open grasslands. By the 1880s, they

appeared to be extirpated from the region east of the Missouri River (Severson and Sieg 2006).

Refuge records indicate that 15 elk were brought from Yellowstone National Park to the refuge in 1917. Historical data specifies that subsequent introductions of elk did not occur until 1941, when a bull elk was brought in from Fort Niobrara National Wildlife Refuge in Valentine, Nebraska. It appears that approximately 5 other animals were brought in between 1949 and 1991, mostly bulls from Fort Niobrara. In 1993, 3 elk (2 females and 1 male) were transferred from Teddy Roosevelt National Park, in Medora, North Dakota, to the refuge. Currently the refuge maintains about 20–25 elk.

White-tailed Deer

Records specify that only a few scattered populations of white-tailed deer occurred in suitable habitat across eastern North Dakota. It is possible that the abundant elk populations may have been a factor in the limited number of deer (Severson and Sieg 2006). According to Roger Johnson, a big game biologist, NDGF, pre-settlement deer populations were notably lower than current day numbers. As an example, currently deer numbers in the area average 2–3 animals per acre. Even 20 years ago, deer populations were less then 1 animal per acre (Roger Johnson, NDGF, personal communication).

Historical data evidences that 4 white-tailed deer were introduced into the refuge around 1917 from Fargo, North Dakota. Later introductions occurred in 1947 with a buck from the Camp Grafton National Guard campus near Devils Lake, North Dakota, and a local buck from the Devils Lake area in 1952. Populations of deer have ranged from 10–50 animals since introduction, with current numbers around 15–30.

Prairie Dogs

Prairie dogs are native to North Dakota but primarily are found in western expanses of the state. The black-tailed prairie dog was introduced into the refuge in 1974. The current prairie dog town covers about 1.5 acres in the big game forest and prairie and includes several hundred dogs. Prairie dogs can significantly alter habitat and can quickly expand their range if they are not monitored and managed.

Other Mammals

Sullys Hill National Game Preserve also supports several other less conspicuous mammals for which active management is not implemented.

©Cindie Brunner

Tiger swallowtail butterfly.

Representative species using the refuge include coyote, grey squirrel, red fox, eastern cottontail, badger, beaver, raccoon, striped skunk, fisher, muskrat, fox squirrel, weasel, mink, woodchuck, deer mouse, and meadow vole. Based on the checklist of state mammals (Wiehe and Cassel 1978), it is anticipated that more than 35 mammal species could occur across the refuge. Extremely limited data are available for these mammals in this area of North Dakota and specifically at the refuge. One study was completed in 1979–1980 on fox squirrel activity and time budgets on the refuge (Nelson 1981), and a current study is underway to census fishers across the refuge and in eastern North Dakota.

Insects, Reptiles, and Amphibians

Inventories of other wildlife, such as invertebrates and reptiles and amphibians, are limited. The only known survey in this category was completed by Royer et al. (1998), who developed a comprehensive butterfly list for the refuge (see appendix D). Throughout the woodland and grassland habitats of the refuge 50 species were identified and it is speculated that up to 19 more species could likely occur. Royer et al. (1998) indicated that there is a remote possibility that a Dakota skipper could occur on the south prairie, perhaps among the purple coneflowers.

Several species of fish also occur at the refuge in areas that interconnect with Devils Lake. Although fish surveys or inventories have not occurred on the refuge, common species present across Devils Lake include walleye, northern pike, yellow perch, white sucker, white bass, and black crappie.

4.4 CULTURAL RESOURCES

The following information concerning cultural resources is taken directly from the following document, "Sullys Hill National Game Preserve: 2003 Archaeological Survey and Test Excavations, Benson County, North Dakota" (Jackson et al. 2004).

Human occupation of the northern plains is documented as early as 12,000 years ago, first by American Indians and much later by Euro-Americans. The various human adaptations to the northern plains environment that have taken place over time, in what is North Dakota today, have come in response to basic changes in climate and the movements of people, technology, and ideas. Prehistoric cultural traditions that reflect essential settlement-subsistence patterns and technological complexes have been defined on the basis of archeological investigations at sites in the northern plains, particularly North Dakota (Frison 1991, Gregg 1984, Lehmer 1971, Schneider 1982). Such cultural traditions are generally sequential, but often exhibit some temporal overlap.

The cultural environment of what is now North Dakota is described within the framework of a regional cultural chronology that is continually being expanded and refined as archaeological and historical research produces new information on past human occupation of the area. It is organized into periods that are, for the most part, named for the cultural traditions that dominated those times. Cultural periods also imply differences in certain aspects of material culture, particularly basic technology, as represented by distinctive artifact types and assemblages. The project area is located in the Sheyenne River Study Unit of the "North Dakota Comprehensive Plan for Historic Preservation: Archeological Component" (Haury 1990). The reader is referred to this document for additional information on the cultural-historical setting of the refuge. More detailed information specific to the Devils Lake area is also available in recent archeological reports (Jackson and Toom 2002, Toom et al. 2000). A brief outline of the region's cultural history of the project area follows.

The regional chronology, as it exists today, is useful for organizing and describing identified cultural manifestations. It is presented within a framework of five basic periods: (1) Paleo-Indian, (2) Plains Archaic, (3) Plains Woodland, (4) Plains Village, and (5) Historic. The names of the first four periods also refer to mainly prehistoric American Indian cultural traditions, with the Plains Village tradition extending into early historical times. The Historic period encompassed that span of time following the decline of the Plains Village tradition and the rise of the Plains Equestrian tradition, as a result of the introduction of the horse and Euro-American manufactured trade goods among native peoples. It subsumed American Indian lifeways during protohistoric and early historic times in the northern plains, from about A.D. 1780–1880 (State Historical Society of North Dakota 1990). Later in the Historic period, at the end of the Plains Equestrian tradition—A.D. 1880, the Euro-American tradition became dominant.

The dominant historical influence in the specific project area was the 1867 establishment of Fort Totten. It served as a military base to control and protect the Sioux residents of the newly formed reservation on the south shore of Devils Lake. Fort Totten functioned as a military fort until 1890, and soon after that the post consolidated with the Catholic mission school and served as an industrial school for the reservation (DeNoyer 1910, Robinson 1966, Wertenberger 1967). The industrial school was closed in 1935 and the post served as a tuberculosis sanitarium until 1939 (Friends of Fort Totten Historic Site, no date). The fort then served as a community school until 1959 and in 1960 it was formally transferred to the State Historical Society of North Dakota as a state historic site. Fort Totten is listed on the National Register of Historic Places and the North Dakota State Historic Sites Registry.

Sullys Hill National Game Preserve was originally part of the old military reservation. In 1904 these lands were proclaimed as a national park by President Theodore Roosevelt and removed from military jurisdiction. Congress established the area as a big game preserve in 1914, jointly administered as a national park and game preserve by the Departments of Interior and Agriculture. In 1921, it was also made a bird refuge. The refuge was transferred from the National Park Service to the U.S. Fish and Wildlife Service in 1931.

Known Archaeological Resources

The earliest archeological reporting in what is now Sullys Hill National Game Preserve was done by T. H. Lewis in 1886 (Lewis 1898). Contracted by Alfred J. Hill of St. Paul, Lewis conducted "field surveys of rapidly disappearing antiquities" for the privately funded Northwestern Archaeological Survey (Keyes 1928). Three mound sites (32BE1, 32BE2, and 32BE27) within the present-day refuge were originally reported by Lewis. Two of these mound sites (32BE1 and 32BE2) were formally recorded by the Smithsonian Institution River Basin Surveys in 1946 (Mallory 1966). All three

mound sites were revisited by a 1989 University of North Dakota (UND) survey crew to document and update information concerning all of the mound sites in North Dakota reported by T.H. Lewis (Haury 1990).

The Irvin Nelson site (32BE208) was originally recorded by Mallory (1966) after prehistoric artifacts and human bone had been found in the yard of the refuge manager's residence. Prior to construction of a new headquarters building and maintenance shop at the site location, auger test excavations were conducted by UND in 1979 (Fox 1979). Based on the positive results, a formal test excavation program was recommended. Those investigations were conducted by North Dakota State University (NDSU) personnel in 1980 (Fox 1982). The cultural materials collected from the site are currently being reexamined by UND (Toom 2002).

Archaeological investigations conducted in 1991 by the North Dakota Department of Transportation along Highway 57 resulted in the recordation of two sites (32BE45 and 32BE46) and one site lead (32BEX74) within Sullys Hill National Game Preserve (Christensen 1991, 1992). Only the site lead (32BEX74) is within the project areas reported herein. Lead site 32BEX74 was upgraded to an archaeological site and re-recorded as part of site 32BE126.

In 1997, an emergency dike was slated for construction using fill from two borrow areas within the refuge. The removal of fill from the two borrow areas was carefully monitored, and the area to be impacted by dike construction was inspected for archaeological materials (Kinney 1997). Monitoring was conducted during the stripping operations until the excavators were below potentially culture-bearing strata. No archaeological sites were found during the course of this work.

Service archeologist Rhoda Lewis conducted several cultural resource inventories prior to refuge improvements during the 1990s (Lewis 1995, 1999a, 1999b, 1999c, 1999d). No archaeological sites were recorded over the course of these surveys. Four proposed project areas at the refuge were inventoried in 2002 by Lewis. The location of a new education and visitor center and an access road from Highway 57 were essentially the same locations as those investigated during the current survey project. The location of a residence and shop that was surveyed at that time is no longer a candidate for construction. Also, the stone pillared entrance gate to the refuge was recorded in 2002 as site 32BE114. It was recommended that subsurface excavations be conducted at the proposed education and visitor center location (Lewis 2002).

4.5 SPECIAL MANAGEMENT AREAS

In addition to refuge status, lands may have additional designations which overlay refuge status.

Natural Area

Sullys Hill National Game Preserve was designated by the state as one of only 19 natural areas in North Dakota. Four of these 19 areas are national wildlife refuges, including Sullys Hill National Game Preserve. Areas given this designation have special qualities found only on undeveloped land. These qualities represent glimpses through a window in time on a portion of North Dakota's presettlement landscape—a "living history." This designation also signifies the existence of a diverse array of native plants and wildlife that belong together in finely-tuned natural communities, places of inherent beauty and interest, outdoor classrooms for teaching life sciences and earth sciences, outdoor laboratories, and benchmarks against which to gauge landscape changes (Umber 1988). The refuge possesses all of these unique qualities.

Wilderness Review

Although Sullys Hill National Game Preserve reflects some of the qualities desired in wilderness, at 1,675 acres, the refuge does not meet the size criteria for wilderness designation, plus it has several miles of roads and trails within its boundary.

Scott Ralston/USFWS

Children's activity.

4.6 VISITOR SERVICES

The Act of March 3, 1931 established recreation as one of the purposes of Sullys Hill National Game Preserve.

Hunting And Fishing

The legislative purposes for Sullys Hill National Game Preserve do not allow hunting on the refuge. Currently, public fishing is not permitted on the refuge due to a lack of available resources to manage this use and its impacts to the refuge. In addition, the refuge fishery is minimal but is bordered by one of the most popular fishing areas in the state and the nation, Devils Lake. The refuge has used its limited fishery as an education tool to educate youth about the life cycles of fish and fishing techniques.

Wildlife Observation And Photography

Sullys Hill National Game Preserve hosts over 60,000 visitors annually, most of which come to observe and photograph wildlife. The refuge provides outstanding opportunities due to the unique mix of prairie, forest, and wetland habitats that attract a rich diversity of resident and migratory wildlife. To accommodate these visitors, the refuge offers a 4-mile self-guided auto tour that travels down winding forest roads and eventually breaks into open prairie and savanna areas. Visitors on the auto tour can only leave their vehicles to venture onto five observation platforms: the wetland, prairie dog town, Devils Lake vista, nature trail, and Sullys Hill overlooks. While on the auto tour, visitors have the opportunity to view and photograph plains bison, Rocky Mountain elk, white-tailed deer, turkey, and prairie dogs.

The refuge features a mile-long nature trail and 1.6 miles of trails for hiking and cross-country skiing, with 1 observation platform to observe a host of resident and migratory wildlife. The forests, interspersed with wetlands, provide opportunity to observe a host of bird species, including numerous warblers, wood ducks, kingfishers, hooded mergansers, and black-crowned night herons. Birding opportunities are available all year. While warbler numbers peak in the month of May and in late October, bald eagles commonly stage on the refuge in late winter. Hardy species like pileated woodpeckers are also present in the winter.

The fully-accessible education and visitor center features a full wall of windows and an outside patio to observe a host of species frequenting the birding garden. Common species include rose breasted grosbeak, American gold finch, black capped chickadee, and hairy woodpecker.

Environmental Education

A 6,000 square foot education and visitor center was constructed in 2004. The center features a waterfowl photo gallery, a Rocky Mountain elk exhibit, and a birding garden. Facilities for learning also include two classrooms with dedicated audiovisual equipment, teaching aids, and instructional materials. This center has quickly become a regional conservation learning center for students and adults within a 90-mile radius of the refuge. Refuge staff, in cooperation with local teachers, provide educational presentations to over 5,000 students and other groups annually. The refuge also has a remote classroom to facilitate field-based learning opportunities. Currently, most of the environmental education is on-site.

Interpretation

The refuge hosts two annual events, "Sullys Hill Birding and Nature Festival" and "Winterfest," with activities for both adults and children. The birding and nature festival has been attracting 1,200–2,100 visitors from all over the country for the 3-day event. Winterfest is a one-day youth-focused festival that attracts over 100–200 participants each year. To plan and execute these festivals, refuge staff work closely with the Sullys Hill Wildlife Refuge Society, the refuge "friends group." In addition to these special events, interpretive presentations and tours are provided upon request. The refuge also features an outdoor amphitheater to host interpretive programming.

The five observation platforms on the auto tour and nature trail include site-specific interpretive displays. The refuge also has two information and interpretive kiosks located at the refuge entrance and the education and visitor center.

4.7 CURRENT SOCIOECONOMIC CONDITIONS

The goals and objectives of the CCP were developed after considering the socioeconomic conditions of the area surrounding the refuge.

Population And Demographics

The population in Benson County, North Dakota was estimated at 6,997 in 2006. Since 2000, there has been a 0.5% gain in the county's population. Although this number is low, this is actually better than the state of North Dakota, which saw an overall net loss of 0.1% in its population. There

are 5 people per square mile in Benson County (U.S. Census Bureau 2006).

The majority of the land in the county is used for farming and livestock ranching. There are 567 farms, totaling 732,870 acres (53% of the county lands), with an average size of 1,294 acres. Major crops are corn, grains, soy beans, sunflowers, and sorghum grown on 558,127 acres. The remaining acres are used for various livestock grazing. The market value of the products produced on these farms totals over $55 million (USDA 2002).

The refuge is surrounded on three sides by the Spirit Lake Nation's reservation boundary. The major race in the county is American Indian at 51.2%. The remaining residents are 48.1% White, 2.5% Hispanic, and 0.1% African American. (U.S. Census Bureau 2006). In 2000, 73.8% of county residents were high school graduates, while 10.9% had obtained a bachelors degree or higher.

Employment And Income

The median household income in Benson County in 2004 was $28,058, with 22.4% (national average is 9.2%) of the population below the poverty level. Educational, health, and social services employ the majority of the county residents. The greatest source of income for the county is federal spending at $126 million in 2004. The unemployment rate in the county is 7.4% (U.S. Census Bureau 2006).

Staff

Historically, the refuge was a stand-alone station and had a manager and biological technician located on-site. Approximately 35 years ago, the refuge became part of the Devils Lake Wetland Management District Complex. The staff was cut in half, leaving only a manager assigned to the refuge. The overall budget is quite modest, including the salary for the manager and a very modest operating budget. The success of the refuge program is heavily dependent upon the "friends group" and other volunteers to conduct refuge programs.

Facilities

Facilities have remained fairly updated over the years. Overall, facilities are used to carry out habitat and wildlife management, as well as the popular environmental education, interpretation, and wildlife-oriented visitor services program. Current total visitation is 60,000 visitors annually. Refuge visitors are charged an entrance fee of $2.00 or may use their annual refuge pass. Most of these funds remain at the refuge to maintain facilities and conduct visitor services programs.

Facilities on site include the following:

- 6,000 square foot education and visitor center with office
- 40-foot by 100-foot maintenance shop and storage facility
- 3 bedroom manager's quarters
- 2 buildings for fire operations and 1 for biological equipment storage
- 3 bedroom bunkhouse for seasonal fire staff
- 5 overlooks
  - Devil's Lake Vista
  - Sullys Hill overlook
  - Wetland overlook
  - Prairie dog town overlook
  - Nature trail overlook
- 4-mile asphalt auto tour route and parking lot
- 28-foot by 32-foot remote classroom
- Nature trail
- Amphitheater
- Fenced boundary including electric entrance gate with timer
- Kiosks and interpretive signs
- Entrance sign with lighting
- 2 remote self-contained restrooms
- Hay pen
- Fuel tanks
- 2 trailer pads with water and power (for volunteers)

Visitor Spending

Sullys Hill National Game Preserve is one of the primary economic engines in the lake region for recreation and tourism. The Devils Lake region is well known for its fishing, hunting, bird watching, camping, history, culture, and other associated outdoor recreation. The refuge, in consort with myriad other outdoor adventures, provides a total and unique experience for the visitor, while generating important revenues for the local economy.

The refuge attracts 60,000 visitors annually. In a 2006 review of visitation, guests from 44 states used the refuge, and 45% of the total visitors that year were from outside North Dakota.

There have been many studies on the economic benefits of national wildlife refuges and the outdoor recreation industry. A 2006 report by the Outdoor Industry Foundation did a review of eight outdoor activities, including bicycling, camping, fishing, hunting, paddling, snow sports,

trails and hiking, and wildlife viewing. The report states that these activities contributed $730 billion annually to the United States economy. The industry generates $289 billion in retail sales and services across the country while supporting 6.5 million jobs. The sector that had the highest participation was wildlife viewing, with 66 million citizens. Sullys Hill National Game Preserve is most known for its wildlife viewing opportunities.

The "National Survey of Fishing, Hunting, and Wildlife Associated Recreation" has been completed every five years since 1955. In 2006, 87 million Americans 16 years old and older (38% of the U.S. population) enjoyed some recreational activity related to fish and wildlife. Dollars expended by this group in 2006 for wildlife-related recreation was $120.1 billion. The largest component of this survey was also wildlife watching, with the average wildlife watcher spending $628.00 annually on this activity. In the northcentral region of the survey area, which includes North Dakota, 44% of this population participated in wildlife watching activities. The report states that $20.5 million was spent on wildlife watching in North Dakota.

Another study looked at the economic impact of birding ecotourism on communities surrounding 8 national wildlife refuges in 1993–1994 (Kerlinger 1994). Birder visitation at these refuges ranged from 17,000 to 200,000 annually. The average age of visitors was mid-40s to lower 50s. Family incomes and education levels were far greater than the national average. More than 70% reported they had attended some college. More than 50% of visitors were traveling with a spouse. Two measures of economic activity were calculated: total amount spent by visitors and total economic impact of visitors on the communities surrounding a refuge. The actual economic impact of visitors on communities surrounding each of the refuges ranged from slightly less than $1 million to $14 million (Kerlinger 1994). One refuge that had some similarities to Sullys Hill National Game Preserve was Salton Sea National Wildlife Refuge, which had an annual visitation of 60,000 (same as Sullys Hill National Game Preserve). The average amount spent on a visitor's entire trip to Salton Sea was $670 per person and the average visitor was worth between $38 and $57 to the local community. If this figure is averaged at $47.5 per visitor and 60,000 visitors to the refuge, the economic impact to the local community is $2.8 million in 1993–94 dollars.

A 2004 report completed by Hodur, Leistritz, and Wolfe looked at a local birding festival in Jamestown, North Dakota. Total expenditures for all participants averaged $235 during the course of the 4-day event. Expenditures in the local Jamestown area were $162 per participant.

Sullys Hill National Game Preserve is an important refuge for migratory birds, as well as large mammals such as plains bison and Rocky Mountain elk. This refuge is also an important location for tourism and a vital attraction that brings money into the surrounding communities.

PARTNERSHIPS

Sullys Hill National Game Preserve is able to accomplish much of the work and mission through the use of various partnerships, friends, volunteers, and supporting agencies.

The Sullys Hill Wildlife Refuge Society was North Dakota's first refuge "friends group." This organization is instrumental in facilitating special events such as the "Sullys Hill Birding and Nature Festival" and "Winterfest." This group is also a cooperating association and supports the refuge in many ways, including advocacy, the refuge gift shop, and staffing the education and visitor center.

The refuge receives much needed assistance through grants or matching money from nongovernmental associations, internships, and research, university partnerships, various volunteers, school system partnerships, and help from local and state agencies or organizations.

5 Environmental Consequences

Scott Ralston/USFWS

Forest prairie view from hiking trail.

This chapter provides an analysis of the potential effects on environmental resources associated with the implementation of the management alternatives for Sullys Hill National Game Preserve. The Service assessed the environmental consequences of implementing each of the alternatives on the biological, physical, social, economical, cultural, and historical resources of the refuge.

5.1 METHODS

The determination of effects is evaluated at several levels, including whether the effects are adverse or beneficial and whether the effects are direct, indirect, or cumulative with other independent actions. The duration of effects also is used in the evaluation of environmental consequences.

Direct effects are those where the impact on resource would be immediate and a direct result of a specific action or activity. Examples of a direct effect include the effect of trail construction on vegetation along the trail or the effect of hunting on wildlife.

Indirect, or secondary effects, are those that are induced by implementation actions, but occur later in time or farther removed from the place of action through a series of interconnected effects. Examples of indirect effects include the downstream water quality effects from an upstream surface disturbance or the impact that recreational use along a trail may have on nearby plant communities.

A cumulative effect is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7).

Impacts are often described in terms of their context, intensity, and duration. The duration of effects are described as either short term or long term. Short-term effects would persist for a period of 3–5 years and consist primarily of temporary disturbance to habitat restoration or facility construction and subsequent revegetation efforts. Long-term effects would last more than 5 years after project initiation and may outlast the 15-year life of the CCP. Many long-term effects would be in the form of long-term benefits to wildlife habitat resulting from habitat management actions.

5.2 EFFECTS COMMON TO ALL ALTERNATIVES

A few potential effects would be similar under each of the alternatives.

- The implementation of any of the alternatives would follow the refuge's best management practices.
- The alternatives would avoid and minimize impacts on federally threatened and endangered species, to the extent possible and practicable.
- The refuge, contractors, researchers, and other consultants would continue to acquire all applicable permits, such as for future construction activities.

The sections below describe other effects expected to be similar for each alternative.

Regulatory Effects

As indicated in chapter 1, the Service must comply with a number of federal laws, administrative orders, and policies in the development and implementation of its management actions and programs. Among these mandates are the National Wildlife Refuge System Improvement Act of 1997, the Endangered Species Act of 1973, the Clean Water Act of 1977, and compliance with Executive Orders 11990 (Protection of Wetlands) and 11988 (Floodplain Management), and the National Historic Preservation Act, etc. The implementation of any of the alternatives described in this environmental assessment would not lead to a violation of these or other mandates.

Environmental Justice

Within the spirit and intent of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," no actions being considered in this environmental assessment would disproportionately place any adverse environmental, economic, social, or health effects on minority or low-income populations compared to the general public.

The Service is committed to ensuring that all members of the public have equal access to America's fish and wildlife resources, as well as equal access to information that would enable them to participate meaningfully in activities and policy shaping.

Cultural Resources

As a whole, cultural resources would be enhanced through protecting known significant resources and extending protections to newly discovered significant cultural resources.

Cultural resource investigations at the refuge have been limited and there are probably many unrecorded resources. All undertakings (as defined by Section 106 of NHPA) require cultural resource review and may necessitate survey, research, and/or excavation to satisfy provisions of NHPA, NEPA, and other applicable historic preservation acts and laws.

Potential adverse effects to a significant resource from an undertaking would be addressed by the regional archaeologist (region 6) in consultation with the North Dakota State Historic Preservation Office, tribal historic preservation offices, and other interested parties.

Global Warming

The actions proposed in this draft CCP and EA would conserve or restore land and habitat, thus retaining existing carbon sequestration at the refuge. This action would contribute positively to efforts to mitigate human-induced global climate change.

The use of prescribed fire, which releases CO_2, would result in no net loss of carbon because new vegetation would quickly replace the burned-up biomass. Overall, there should be little to no net change for carbon sequestered at the refuge from any of the management alternatives. As it relates to global climate change, the documentation of long-term changes in vegetation, species, and hydrology is an important part of research and monitoring. Adjustments in management may be necessary over time to adapt to a changing climate.

Geology And Soils

All alternatives would positively affect soil formation processes on the refuge lands. Some disturbances to surface soils and topography would occur at those locations selected for (1) administrative, maintenance, and visitor facilities; (2) introduced and invasive species removal and eradication; and (3) restoration of native habitat.

Water Quality, Wetlands, And Floodplains

All alternatives would positively affect water quality. Positive effects are anticipated from protecting groundwater recharge, preventing

runoff, retaining sediment, and minimizing nonpoint source pollution. The management alternatives are not anticipated to have any adverse effects on the area's wetlands and floodplains.

5.3 DESCRIPTION OF CONSEQUENCES BY ALTERNATIVE

Management actions are prescribed as a means for responding to problems and issues raised by Service managers, the public, and governmental partners. Because management would differ for each alternative, the environmental and social effects resulting from implementation would likely differ as well.

The following section provides an analysis of the effects estimated to result from alternative A (no action), alternative B, and alternative C (proposed action). A summary of this narrative is contained in table 2 in chapter 3.

Woodland Habitat

Alternative A (No Action)

Ungulates would be maintained at historical levels and allowed to graze all season, with no time or space restrictions. This would continue to impede the development of understory and midstory forest layers and inhibit forest regeneration, thus limiting available habitat for forest-interior breeding birds.

Wildfires (primarily caused by vandalism) would continue to cause the tree rows in shelterbelts to deteriorate and increase noxious weed invasion between and adjacent to the rows. Until these trees die and decay, these tree rows would also continue to fragment grassland habitats.

With current staffing limited management, monitoring, and research would occur, making it difficult to monitor the impacts of management decisions and take the necessary management actions to correct them.

Alternative B

Most of the forested lands would continue to provide adequate forest-breeding bird habitat. Establishing woodland restoration units, totaling 80 acres, and using exclusion fences and appropriate management techniques would provide additional habitat for interior-forest breeding birds. Wildfires would be reduced in the windbreaks in the hay units, allowing for increased sustainability of the tree rows and reduced noxious weed invasion.

Increased staffing would allow for the implementation of proposed management of habitat improvement.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative B except that ungulate populations would be reduced to levels that would allow for more understory and midstory growth in the woodland areas outside of the 80-acre restoration units, for the benefit of interior-forest breeding birds. Forestry stand improvements would provide optimal habitat for migratory birds that use all levels of the forest structure.

Removal of selected tree rows would increase the central core area of grasslands, benefitting grassland-nesting birds and decreasing fuels for wildfires, while allowing the refuge to control invasive plants on newly-exposed ground.

Prairie Habitat

Alternative A (No Action)

If ungulates are allowed to continue to graze without restrictions of time or space, undesirable plants would increase, including invasive species. There would be a loss of native grassland plant species and structure, making the area less attractive to migratory birds dependent on forest-edge habitat and other grassland-dependent wildlife and insects.

Extensive grazing would result in an increase in soil erosion, causing a loss of nutrient-rich topsoil while increasing siltation in surrounding waters. There would be a reduction in plant vigor and regrowth, especially in dry years. This would not only impact grassland-dependent migratory birds, but would also reduce the quality and quantity of forage for the refuge's ungulates.

Prescribed fires would continue to be used at appropriate times as a disturbance tool to mimic natural processes and stimulate the regrowth and diversity of native vegetation. However, uncontrolled wildfires (caused by vandalism) occurring at inappropriate stages of vegetation growth may actually increase invasive species such as smooth brome, Kentucky bluegrass, and noxious weeds. These nonnative species have the potential to out-compete the native plant species, creating a monotypic stand of grass that is less attractive to grassland-dependent birds.

Noxious weeds and encroaching woody species would continue to be controlled, maintaining the integrity and structure of the grassland.

Annual haying of the hay unit would provide winter food for ungulates in the big game unit; however, because of the annual defoliation of the vegetation on this site, residual wildlife cover would be limited.

Alternative B

The use of prescribed grazing (controlling numbers of ungulates, rotation, and exclusion fences) and prescribed fire would improve the emulation of historical conditions under which the wildlife and vegetation of the prairie evolved, while improving the diversity of native grasses and forbs. These management tools will control invasive species, such as smooth brome grass, provide necessary disturbance to invigorate the growth of native plant species, and prevent the encroachment of woody species into the grasslands.

Installing and rotating exclusion fences would be labor intensive and costly but would also control grazing in less than ideal habitats, reduce soil erosion, and improve wetland water quality. Controlling noxious weeds and invasive plant species would allow for restoration of native plants. All of these activities would increase plant vigor for ungulate grazing and wildlife use.

Reducing hazardous fuels through prescribed burning and mechanical methods would minimize threats to life and property on the refuge and surrounding land. Rotational haying would provide ungulates with adequate winter food and improve residual cover for wildlife.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative B except that the structure of the enhanced native prairie would be more representative of a historical mixed-grass prairie, providing increased opportunities for forest-edge and grassland-dependent bird use and a unique opportunity to research and monitor healthy native prairie in the northeastern mixed-grass prairie zone. This monitoring would serve as a baseline for grassland restoration efforts across the Devils Lake WMD Complex and the region. Selected hayland acres would be dedicated to migratory bird habitat through the restoration to a diverse mixture of native herbaceous prairie vegetation.

Wildlife Population Management

Alternative A (No Action)

The current level of overgrazing and overbrowsing would continue, and prairie and forest habitat would provide reduced benefits to targeted migratory birds. Herd health history would continue to be provided to appropriate state and federal agencies so that diseases, such as CWD, may be monitored and controlled. At current levels, winter supplemental feeding would put animals at higher risk for certain diseases and parasites.

The refuge would continue to participate in the bison conservation initiative by monitoring and maintaining the genetic integrity of its bison herd. Prairie dog populations would continue to expand in adjacent grassland areas, altering grassland habitats and leaving them devoid of vegetation. The refuge's boundary fences would be maintained, thereby reducing trespass, disease transmission, and animal escape.

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Photographer.

Alternative B

Consequences would remain the same as those for alternative A except that reduced ungulate numbers would provide improved habitat for migratory birds by reducing demands on forest browse and grassland plants. The prairie dog population would not expand beyond the original 1.5 acre boundary and would not negatively impact adjacent grassland areas.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative B except that lower levels of ungulates would further increase refuge floristics that support migratory bird nesting and migration habitat. Reduced supplemental feeding of ungulates would result in improved health, specifically for elk. Disease episodes would be reduced and prevented as surveillance increases, and necessary and appropriate treatments are used.

Genetics of each bison on the refuge would be known and would be the basis for transfers of animals to other refuges. Genetic health would be maintained with periodic ungulate introduction.

Environmental Education And Outreach

Alternative A (No Action)

There would continue to be a lack of input into programs presented in the refuge classrooms by outside partners, resulting in missed opportunities to educate the public about the refuge and its purposes, promote wetland and grasslands conservation, and gain support for the Refuge System.

A lack of staff and structured programs would result in lost opportunities to reach and educate more students in the surrounding communities through consistent in-school programs. Without adequate staff available, there would be no guarantee that the current two annual events would continue. This would result in a net loss of reaching and educating over 2,500 adult and children annually.

Continued seasonal visitation would result in a loss of opportunities to reach the area's winter visitors. Also, this independent visitor experience affords no methods to monitor and evaluate the visitor's experience at the refuge to ensure that the refuge's education and outreach goals are being met.

Continuing to provide American Indian programs at refuge events would allow visitors to learn about the culture and traditions of the Spirit Lake Nation.

Sullys Hill National Game Preserve is very dependent on the volunteer "friends group" to ensure that refuge visitor services programs are carried out. Although this makes the programs somewhat vulnerable, it has also been a great asset to each and every program.

Alternative B

Consequences would remain the same as those for alternative A except that this alternative would ensure that all education programs presented on the refuge by other partners support the refuge's environmental education themes of promoting wetland and grassland conservation. Limited off-site programs would expand environmental education opportunities for surrounding youth, teaching them about the benefits of conserving wetlands and grasslands. Actively pursuing relationships with surrounding teachers and providing them with specific programs would impact a larger group of area students with a consistent environmental education message.

Additional visitor services staff and resources would allow the current annual events to continue while ensuring that a consistent message is presented at each of these events. Providing and maintaining more consistent education and visitor center hours would eliminate some frustrations expressed by disappointed visitors while providing for additional environmental education opportunities.

A more developed cultural program would reach more visitors and students, creating a greater understanding of the Spirit Lake Nation's history and traditions. Regular contact with the media would ensure that the public is kept informed on refuge programs and visitor services activities. Providing support to the "friends group would generate additional funding support for refuge programs.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative A except that programs developed and presented by refuge staff would have the greatest effect on educating students, on- and off-site, about the refuge system, the refuge, and wetland and grassland preservation. In addition, expanding programs off-site would reach the maximum number of students in the surrounding area. Offering well-organized, consistent programs would give adults and children multiple opportunities to learn about Sullys Hill National Game Preserve and its resources and expose

them to conservation opportunities in their communities and homes. Working more closely with the teachers and students while developing refuge and state-specific environmental education programs, would ensure that the maximum number of students are reached with a consistent, relevant message that focuses on wetlands, grasslands, and the conservation role of the Refuge System.

Opportunities would be expanded to recruit American Indian students into local and national employment in the refuge system.

Additional volunteers would allow the refuge visitor services programs to expand, including additional opportunities for the public to learn from and interact with knowledgeable refuge volunteers.

Visitor Services And Interpretation

Alternative A (No Action)

Visitors would continue to be provided limited, inconsistent opportunities to enjoy and learn about the refuge and surrounding resources through interpretive displays and occasional interactions with the refuge staff. There would be lost opportunities for children and adults to independently learn about and explore the refuge and its resources and the many benefits of the National Wildlife Refuge System.

The seasonal closing of the refuge in the winter would continue to result in a significant loss of wildlife viewing and interpretation opportunities during the winter months and many missed opportunities to reach adults and children.

Staff-led interpretive programs would continue to take added time and staff to present information and facilitate the visitor's experience. A lack of staff would continue to result in limited outdoor classroom programs and lost opportunities to provide outdoor interpretive programs highlighting wetland and grassland conservation.

Lack of maintenance may cause loss of building integrity.

Alternative B

Expanded education and visitor center hours and upgraded interpretive displays would provide a more hands-on experience for the visitor to learn about the importance of conserving, and how to conserve wetlands and grassland habitats. The accessible and interpreted trails and overlooks would greatly expand opportunities for visitors of all abilities to independently learn about and understand the refuge and its resources. Students would be provided expanded opportunities to learn in nature, not just about nature. Upgraded interpretive displays would provide visitors with the most relevant, up-to-date information.

Increased entrance fees and fee compliance would generate the resources needed to provide additional interpretive opportunities. Outdoor programs for visitors of all abilities would be expanded, providing additional quality programs and opportunities. Upgrading visitor services facilities would provide a higher quality experience and improve the visiting public's impression of the refuge.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative A except that keeping the education and visitor center and facilities open year-round would greatly expand the opportunities to educate more adults and children while providing them a more complete perspective of the conservation role of the refuge and the Refuge System. Additional environmental education equipment would improve the quality of programs while enhancing the visitors experience and ability to learn and understand.

An automated fee collection point would improve fee compliance, thereby generating more revenue and increasing the ability of refuge staff to maintain and improve environmental education and interpretation facilities. An audio-based interpretive system for the auto tour would increase visitor's knowledge of refuge habitats and wildlife, while enhancing overall visitor experience. Regular maintenance of refuge facilities would ensure there is no loss of structural integrity while ensuring visitors and staff are provided a safe and quality environment in which to learn and work.

Law Enforcement, Facilities, And Maintenance

Alternative A (No Action)

It would continue to be a challenge to ensure visitors keep a safe distance from wildlife, particularly bison and elk. Close encounters would continue to be dangerous for both visitors and wildlife. Although there are informational signs, there would continue to be no comprehensive program to inform visitors about the dangers of wildlife encounters to themselves and the wildlife they encounter.

Without consistent patrols, the refuge would continue to serve as a place for unlawful activities, putting wildlife, staff, and visitors at

risk. The lack of law enforcement presence would increase the likelihood that wildlife would be harmed by illegal activities such as poaching.

There would continue to be a significant loss of revenue for refuge programs from loss of entrance fees due to noncompliance with the honor system fee collection program.

Facilities and lands would continue to be at risk due to limited security, the lack of a fire alarm system, and deterioration through lack of maintenance. This lack of maintenance staff would also continue to limit the refuge's ability to keep the roads open in the winter. This results in a loss of opportunities for visitors to view wildlife and learn about the refuge during the winter months.

The locations of all sensitive cultural resource sites would still be unknown, which would inhibit operations and programs and threaten the protection of these sites.

Alternative B

Visitors would be aware of refuge closed areas and warnings regarding improper encounters with wildlife. This would result in an increase in visitor and wildlife safety. Increased law enforcement presence would encourage refuge visitors to comply with regulations, thus protecting visitors, staff, refuge habitats and facilities, and wildlife. Background checks would be conducted on all volunteers to ensure safety of students, visitors, and facilities.

Additional funds would be available for refuge programs if the fee collection booth at the entrance is staffed.

Added maintenance staff and resources would ensure that refuge facilities receive seasonal maintenance. Refuge facilities would remain safe and continue to function as intended. Keeping refuge roads and education and visitor center open in the winter would provide visitors with year-round opportunities to view wildlife and learn about the refuge.

Initiating a comprehensive cultural resources inventory would improve protection and planning for projects and ensure protection of cultural resources. Protecting and cataloging historical documents would retain a written history of Sullys Hill National Game Preserve, management decisions and actions, and the changes in habitat.

Alternative C (Proposed Action)

Consequences would remain the same as those for alternative A except that a more consistent law enforcement presence during all seasons would further protect refuge resources and improve security, including reducing vandalism and other illegal activities. Collecting 100% of visitor fees would provide additional funds needed to enhance the refuge recreation program and improve visitor and wildlife safety. Regular boundary fence inspections and repairs would minimize impacts from feral animals that could harm native wildlife. Regularly and timely snow removal would provide visitors year-round opportunities to view wildlife and learn about the refuge.

Socioeconomic Impacts

Alternative A (No Action)

Alternative A may have negative impacts on the local economy because there would be no certainty that refuge programs, including annual events, and facilities would be maintained, given the lack of staff and resources. The education and visitor center hours would continue to be sporadic and opportunistic, dependent on the availability of volunteers. This sporadic schedule would make it difficult for local communities to capitalize on tourism opportunities. In addition, the refuge would remain closed in the winter months because resources would not be available to clear snow from the roads.

Alternative B

Alternative B would provide additional seasonal staff and more emphasis on expanding visitor services programs. Annual events would continue with assistance from the "friends group" and volunteers. This additional staff would recruit more volunteers to provide more consistent education and visitor center hours, making the refuge more attractive, thus bringing more visitors into the local communities.

Alternative C (Proposed Action)

Alternative C would expand the staff by an additional 3.5 positions. These added employment opportunities would have some positive effects on the local economy, but the real benefit would be the added refuge visitor services programs, year-round access to the refuge, and the addition of guided refuge tours. These expanded visitor service opportunities could be promoted by the local chamber of commerce, bringing visitors from outside the area and state to spend their resources at the local restaurants, motels, and other complementary businesses.

Cumulative Impacts

Cumulative impacts include the incremental effects of the actions for an alternative, when these are added to past, present, and reasonably foreseeable future actions. Cumulative impacts can be the result of individually minor impacts, which can become significant when added over time.

The Council on Environmental Quality regulations which implement the National Environmental Protection Act require development of mitigation measures when the environmental analysis process predicts potentially significant impacts on habitat, wildlife, or the human environment. None of the activities proposed are expected to produce significant levels of cumulative environmental impacts that would require mitigation measures. Nevertheless, the final CCP would contain the following measures to preclude significant environmental impacts from occurring:

- Federally listed species would be protected from intentional or unintended impacts by having activities banned where these species occur.
- All proposed activities would be regulated to lessen potential impacts on wildlife and plant species, especially during sensitive reproductive cycles.
- Monitoring protocols would be established to determine goal achievement levels and possible unforeseen impacts on resources, for application of adaptive resource management to ensure wildlife and habitat resources, as well as the human environment, are preserved.
- The CCP could be revised and amended after 5 years of implementation, for application of adaptive resource management to correct unforeseen impacts that occur during the first years of the plan.

Scott Ralston/USFWS

Black-tailed prairie dog pups.